Human stem cells from single blastomeres reveal pathways of embryonic or trophoblast fate specification.

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Public Summary:
Mechanisms of initial cell fate decisions differ among species. To gain insights into lineage allocation in humans, we derived ten human embryonic stem cell lines (designated UCSFB1-10) from single blastomeres of four 8-cell embryos and one 12-cell embryo from a single couple. Compared with numerous conventional lines from blastocysts, they had unique gene expression and DNA methylation patterns that were, in part, indicative of trophoblast competence. At a transcriptional level, UCSFB lines from different embryos were often more closely related than those from the same embryo. As predicted by the transcriptomic data, immunolocalization of EOMES, T brachyury, GDF15 and active beta-catenin revealed differential expression among blastomeres of 8- to 10-cell human embryos. The UCSFB lines formed derivatives of the three germ layers and CDX2-positive progeny, from which we derived the first human trophoblast stem cell line. Our data suggest heterogeneity among early-stage blastomeres and that the UCSFB lines have unique properties, indicative of a more immature state than conventional lines.

Scientific Abstract:
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